

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 1-5 (Canceled).

1 6. (Currently amended) A method of analyzing noise content in a digital
2 image, the method comprising:
3 identifying regions of approximately constant pixel value within the digital
4 image;
5 selecting a predetermined number of said identified regions based on pixel
6 value variances within each said identified region;
7 analyzing said selected regions to generate a mathematical model of noise
8 present in the digital image, wherein said analyzing said selected regions to
9 generate a mathematical model of the noise present in the digital image
10 comprises:
11 processing each selected region to remove a mean pixel value from
12 each pixel in the selected region and obtain an approximation of the noise
13 in each selected region,
14 analyzing the power spectral density (PSD) of the noise in said
15 selected regions,
16 generating a parametric model of the noise present in the digital
17 image based on said PSD of the noise in said selected regions, wherein
18 said generating a parametric model of the noise present in the digital
19 image based on said PSD for each selected region comprises:

20 taking a discrete Fourier transform of each noise sample,
21 and
22 squaring each resulting frequency component to produce a
23 periodogram,
24 averaging together the periodograms; and
25 selecting a best-fit linear combination of a small set of predefined PSDs.

1 7. (Previously presented) The method of claim 6, wherein said identifying
2 regions of approximately constant pixel value within the digital image comprises:
3 defining a plurality of regions in the digital image;
4 discarding any of said defined regions in which pixel values are saturated
5 or clipped to generate a set of remaining regions;
6 analyzing said remaining regions to determine variation among pixel
7 values within each remaining region; and
8 identifying said remaining regions having lower variation among pixel
9 value.

1 8. (Previously presented) The method of claim 7, wherein said defining a
2 plurality of regions comprises allowing a user to select said regions.

1 9. (Previously presented) The method of claim 7, wherein said defining a
2 plurality of regions comprises:
3 setting a region size for each of said plurality of regions; and
4 using a random sampling pattern such that said plurality of regions include
5 approximately all of the pixels in the digital image.

1 10. (Currently amended) The method of claim 9, wherein said region size
2 for each of said plurality of regions is ~~about~~ between 16 to and 32 pixels square.

1 11. (Previously presented) The method of claim 7, wherein said discarding
2 any of said defined regions in which pixel values are saturated or clipped
3 comprises:

4 computing the average and standard deviation of all pixels in all samples;
5 and

6 discarding those regions having an average value that is greater than one
7 standard deviation from the overall average.

1 12. (Previously presented) The method of claim 6, wherein said identifying
2 regions of approximately constant pixel value comprises allowing a user to select
3 said regions.

1 13. (Currently amended) The method of claim 6, wherein said
2 | predetermined number of identified regions comprises ~~about~~ between 5 to and 10
3 regions.

1 14. (Currently amended) The method of claim 6, wherein said
2 | predetermined number of identified regions comprises ~~about~~ 7 regions.

1 15 (Canceled).

1 | 16. (Currently amended) The method of ~~claim 15~~ claim 6, wherein said
2 analyzing the power spectral density of the noise in said selected regions
3 comprises:
4 applying an auto correlation function (ACF) model to the noise present in
5 each selected region; and
6 applying a discrete Fourier transform to the ACF model for each selected
7 region to obtain a PSD for the noise in each selected region.

1 17 (Canceled).

1 18. (Previously presented) The method of claim 6, wherein the pixel value
2 is a vector that includes multiple values or channels and each channel is analyzed
3 independently.

1 19. (Previously presented) The method of claim 18, further comprising
2 using a decorrelating transform to uncorrelate any channels that are initially
3 correlated.

1 20. (Previously presented) The method of claim 6, wherein the pixel value
2 is a vector that includes multiple values or channels and each channel is analyzed
3 independently and simultaneously.

1 21. (Previously presented) The method of claim 6, wherein the digital
2 image comprises a plurality of frames and each frame is analyzed independently
3 and simultaneously.

1 22. (Previously presented) The method of claim 6, further comprising
2 performing a homomorphic transformation on each pixel value prior to the
3 analysis and a reverse transformation following the analysis.

1 23. (Currently amended) A computer readable medium containing
2 computer executable instructions for analyzing noise content in a digital image,
3 which, when operating in a processor cause the processor to perform the functions
4 of:

5 identifying regions of approximately constant pixel value within the digital
6 image;

7 selecting a predetermined number of said identified regions based on pixel
8 value variances within each said identified region;
9 analyzing said selected regions to generate a mathematical model of noise
10 present in the digital image, wherein said analyzing said selected regions to
11 generate a mathematical model of the noise present in the digital image
12 comprises:
13 processing each selected region to remove a mean pixel value from
14 each pixel in the selected region and obtain an approximation of the noise
15 in each selected region,
16 analyzing the power spectral density (PSD) of the noise in said
17 selected regions,
18 generating a parametric model of the noise present in the digital
19 image based on said PSD of the noise in said selected regions, wherein
20 said generating a parametric model of the noise present in the digital
21 image based on said PSD for each selected region comprises:
22 taking a discrete Fourier transform of each noise sample,
23 and
24 squaring each resulting frequency component to produce a
25 periodogram,
26 averaging together the periodograms; and
27 selecting a best-fit linear combination of a small set of predefined PSDs.

1 24. (Previously presented) The computer readable medium of claim 23,
2 wherein said identifying regions of approximately constant pixel value within the
3 digital image comprises:
4 defining a plurality of regions in the digital image;
5 discarding any of said defined regions in which pixel values are saturated
6 or clipped to generate a set of remaining regions;

7 analyzing said remaining regions to determine variation among pixel value
8 within each remaining region; and
9 identifying said remaining regions having lower variation among pixel
10 value.

1 25. (Currently amended) The computer readable medium of claim 24,
2 wherein said defining a plurality of regions comprises:
3 | setting a region size of ~~about~~ between 16 ~~to~~ and 32 pixels square for each
4 of said plurality of regions; and
5 using a random sampling pattern such that said plurality of regions include
6 approximately all of the pixels of the digital image.

1 26. (Previously presented) The computer readable medium of claim 24,
2 wherein said discarding any of said defined regions in which pixel values are
3 saturated or clipped comprises:
4 computing the average and standard deviation of all pixels in all samples;
5 and
6 discarding those regions having an average value that is greater than one
7 standard deviation from the overall average.

1 27. (Currently amended) The computer readable medium of claim 23,
2 | wherein said predetermined number of identified regions comprises ~~about~~
3 | between 5 ~~to~~ and 10 regions.

1 28 (Canceled).

1 29. (Currently amended) The computer readable medium of ~~claim 28~~claim
2 23, wherein said analyzing the power spectral density of the noise in said selected
3 regions comprises:
4 applying an auto correlation function (ACF) model to the noise present in
5 each selected region; and
6 applying a discrete Fourier transform to the ACF model for each selected
7 region to obtain a PSD for the noise in each selected region.

1 30 (Canceled).

1 31. (Previously presented) The computer readable medium of claim 23,
2 wherein the pixel value is a vector that includes multiple values or channels and
3 each channel is analyzed independently.

1 32. (Currently amended) A software program product for use with a
2 processor, the software program product comprising processor readable program
3 code for analyzing noise content in a digital image, wherein when said processor
4 readable program code is executed in a processor, said processor readable
5 program code causes said processor to perform the functions of:
6 identifying regions of approximately constant pixel value within the digital
7 image;
8 selecting a predetermined number of said identified regions based on pixel
9 value variances within each said identified region;
10 analyzing said selected regions to generate a mathematical model of noise
11 present in the digital image, wherein said analyzing said selected regions to
12 generate a mathematical model of the noise present in the digital image
13 comprises:

14 processing each selected region to remove a mean pixel value from
15 each pixel in the selected region and obtain an approximation of the noise
16 in each selected region,
17 analyzing the power spectral density (PSD) of the noise in said
18 selected regions,
19 generating a parametric model of the noise present in the digital
20 image based on said PSD of the noise in said selected regions, wherein
21 said generating a parametric model of the noise present in the digital
22 image based on said PSD for each selected region comprises:
23 taking a discrete Fourier transform of each noise sample,
24 and
25 squaring each resulting frequency component to produce a
26 periodogram,
27 averaging together the periodograms; and
28 selecting a best-fit linear combination of a small set of predefined PSDs.

1 33. (Previously presented) The software program product of claim 32,
2 wherein said identifying regions of approximately constant pixel value within the
3 digital image comprises:
4 defining a plurality of regions in the digital image;
5 discarding any of said defined regions in which pixel values are saturated
6 or clipped to generate a set of remaining regions;
7 analyzing said remaining regions to determine variation among pixel value
8 within each remaining region; and
9 identifying said remaining regions having lower variation among pixel
10 value.

1 34. (Previously presented) The software program product of claim 33,
2 wherein said defining a plurality of regions comprises:
3 setting a region size for each of said plurality of regions; and
4 using a random sampling pattern such that said plurality of regions include
5 approximately all of the pixels in the digital image.

1 35. (Currently amended) The software program product of claim 34,
2 wherein said region size for each of said plurality of regions is ~~about~~ between 16
3 ~~to and~~ 32 pixels square.

1 36. (Previously presented) The software program product of claim 33,
2 wherein said discarding any of said defined regions in which pixel values are
3 saturated or clipped comprises:
4 computing the average and standard deviation of all pixels in all samples;
5 and
6 discarding those regions having an average value that is greater than one
7 standard deviation from the overall average.

1 37. (Previously presented) The software program product of claim 32,
2 wherein said identifying regions of approximately constant pixel value comprises
3 allowing a user to select said regions.

1 38. (Currently amended) The software program product of claim 32,
2 wherein said predetermined number of identified regions comprises ~~about~~
3 between 5 ~~to and~~ 10 regions.

1 39. (Currently amended) The software program product of claim 32,
2 | wherein said predetermined number of identified regions comprises ~~about 7~~
3 regions.

1 40 (Canceled).

1 41. (Currently amended) The software program product of ~~claim 40~~claim
2 | 32, wherein said analyzing the power spectral density of the noise in said selected
3 regions comprises:

4 applying an auto correlation function (ACF) model to the noise present in
5 each selected region; and

6 applying a discrete Fourier transform to the ACF model for each selected
7 region to obtain a PSD for the noise in each selected region.

1 42. (Currently amended) The software program product of ~~claim 40~~claim
2 | 32, wherein said analyzing the power spectral density of the noise in said selected
3 regions comprises:

4 applying an auto correlation function (ACF) model to the noise present in
5 each selected region; and

6 applying a discrete Fourier transform to the ACF model for each selected
7 region to obtain a PSD for the noise in each selected region.

1 43 (Canceled).

1 44. (Previously presented) The software program product of claim 32,
2 wherein the pixel value is a vector that includes multiple values or channels and
3 each channel is analyzed independently.

1 45. (Previously presented) The software program product of claim 44,
2 further comprising using a decorrelating transform to uncorrelate any channels
3 that are initially correlated.

1 46. (Previously presented) The software program product of claim 32,
2 wherein the pixel value is a vector that includes multiple values or channels and
3 each channel is analyzed independently and simultaneously.

1 47. (Previously presented) The software program product of claim 32,
2 further comprising:
3 performing a homomorphic transformation on each pixel value prior to the
4 analysis and a reverse transformation following the analysis.

1 48. (Currently amended) A method of analyzing noise content in a digital
2 image, the method comprising:
3 identifying regions of approximately constant pixel value within the digital
4 image, wherein said identifying comprises:
5 defining a plurality of regions in the digital image;
6 discarding any of said defined regions in which pixel values are saturated
7 or clipped to generate a set of remaining regions;
8 analyzing said remaining regions to determine variation among pixel value
9 within each remaining region; and
10 identifying said remaining regions having lower variation among pixel
11 value;
12 selecting a predetermined number of said identified regions based on pixel
13 value variances within each said identified region;
14 analyzing said selected regions to generate a mathematical model of noise
15 | present in the digital image, wherein said analyzing said selected regions to

16 generate a mathematical model of the noise present in the digital image
17 comprises:
18 processing each selected region to remove a mean pixel value from
19 each pixel in the selected region and obtain an approximation of the noise
20 in each selected region,
21 analyzing the power spectral density (PSD) of the noise in said
22 selected regions,
23 generating a parametric model of the noise present in the digital
24 image based on said PSD of the noise in said selected regions, wherein
25 said generating a parametric model of the noise present in the digital
26 image based on said PSD for each selected region comprises:
27 taking a discrete Fourier transform of each noise sample,
28 and
29 squaring each resulting frequency component to produce a
30 periodogram,
31 averaging together the periodograms; and
32 selecting a best-fit linear combination of a small set of predefined PSDs.

1 49. (Previously presented) The method of claim 48, wherein said defining
2 a plurality of regions comprises:
3 setting a region size for each of said plurality of regions; and
4 using a random sampling pattern such that said plurality of regions include
5 approximately all of the pixels in the digital image.

1 50. (Currently amended) The method of claim 48, wherein said
2 predetermined number of identified regions comprises ~~about~~ between 5 to and 10
3 regions.

1 51 (Canceled).

1 52. (Currently amended) The method of ~~claim 51~~claim 48, wherein said
2 analyzing the power spectral density of the noise in said selected regions
3 comprises:
4 applying an auto correlation function (ACF) model to the noise present in
5 each selected region; and
6 applying a discrete Fourier transform to the ACF model for each selected
7 region to obtain a PSD for the noise in each selected region.

1 53 (Canceled).